

A meshed (porous) steel pipe/tube Used as concrete Reinforcement

Field of the invention

This invention relates to concrete reinforcement, such as used in bridges, buildings and other concrete structures, which its reinforcement is use longitudinal and transverse steel reinforce bar wired together, it may substituted by the meshed (porous) steel pipe/tube.

Background of the invention

Over the years, people using longitudinal and transverse steel reinforce bar wire together as steel cage to be concrete reinforcement. This provides good resistance on longitudinal compression (tension) force, transverse shear force and torsion shear force. However, to do this need at least 3 steps of work: a: cut and bent reinforce bar, b: wire reinforce bar together as steel cage, and c: install the steel cage to where the reinforcement is needed. All these three steps of work need many labor and time.

ACI 10.9.1 says: "Area of longitudinal reinforcement for noncomposite compression member shall be less than 0.01 nor more than 0.08 times gross area of section." This large steel to gross area of section ratio made it is possible to use meshed (porous) steel pipe/tube as concrete reinforcement instead the use of the traditional longitudinal and transverse reinforce bar wire together. Since the meshed (porous) steel pipe/tube is buried in concrete it worked as well as traditional reinforcement. Even more, it have some more advantages:

- 1) The meshed (porous) steel pipe/tube can be factory fabricated and is easy to install, this resulting in significant time savings both on shop work and on site construction. It saves time and labor.
- 2) "The transverse reinforcement is needed to prevent the highly stress, slender longitudinal reinforce bars from buckling outward by bursting the thin concrete cover" (Nilson). Since the meshed (porous) steel pipe is one piece in both longitudinal and transverse direction, it has better function to prevent the longitudinal reinforcing buckling than traditional reinforcing in concrete member.
- 3) It is easy to put some more longitudinal/transverse reinforce bar into the meshed (porous) steel pipe/tube before the concrete being poured, to match the designed reinforcement.
- 4) Since the meshed (porous) steel pipe/tube is one piece in both longitudinal and transverse direction, it has better function for shear resistance than traditional ties, so it has better function to resist earthquake.
- 5) When the column is being loaded, it shortens longitudinally and expands laterally, this cause hoop tension in meshed (porous) steel pipe/tube. The meshed (porous) steel pipe has good function to prevent concrete expansion laterally, while the carrying capacity of the confined concrete in the core is greatly increased, Failure occurs only when the steel yields.
- 6) Eventually, the size of the member and the cross sectional area of steel can be reduced, thus saving time and money.

- 7) Since the meshed (porous) steel pipe/tube is one piece in both longitudinal and transverse direction, the beam-column joint and beam-to-girder joint become possible to install like steel structure joint, thus saving time and money.
- 8) The splice of the meshed (porous) steel pipe/tube can be weld or bolt, it is much short than the reinforce bar splice, thus saving time and money.
- 9) Since the meshed (porous) steel pipe/tube is buried in concrete, it has good fireproof function.

The Construction Procedure as follows:

- 1) The meshed (porous) steel pipe/tube can be made in a factory.
- 2) Ship the meshed (porous) pipe/tube to shop or construction site and install it.
- 3) Providing formwork.
- 4) Pouring a mass of concrete into the meshed (porous) pipe/tube and vibrate it to make sure that the concrete fits into and there is no void between the meshed (porous) steel pipe/tube and formwork.
- 5) Stripping the formwork.

Claims

What is claimed is:

- 1) A meshed (porous) steel pipe/tube used as concrete reinforcement comprising: a longitudinal meshed (porous) steel pipe or tube which has many holes on its wall, a mass of concrete is poured into the meshed (porous) steel pipe or tube and through the holes on its wall filled into the place between the meshed (porous) pipe or tube and formwork, so the composite meshed (porous) steel pipe or tube/concrete member can be made.
- 2) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, wherein the diameter of the steel pipe or tube can be various to meet the concrete member need.
- 3) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, wherein the ratio of the cross-sectional area of the steel pipe or tube to concrete can be various from 1% ~ 8%.
- 4) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, some more longitudinal/transverse reinforcement can be put into the meshed (porous) steel pipe or tube before the concrete being poured, to meet the designed cross-sectional area of the steel in concrete.
- 5) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, wherein the thickness of the steel pipe or tube can be various to meet the concrete member need.
- 6) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, wherein the size of the holes on its wall can be various, but can not smaller than 1.5 times of the maximum size of coarse aggregate in concrete, so that the concrete shall easily flow through it and fit into the place between steel pipe or tube and formwork.

- 7) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, wherein the shape of the holes on its wall can be round or other shapes.
- 8) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, wherein the quantity of the holes on its wall can be various, suggested the ratio of total area of the holes to the area of pipe surface is 1% ~ 40%. The holes need to be well distributed on the steel pipe surface, and the distance between 2 holes can not too big, so that the concrete may easily flow into the place between the steel pipe or tube and formwork without void.
- 9) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, wherein some more smaller holes on its wall can be drilled between the holes on the steel pipe or tube in case to avoid debonding between concrete and steel pipe or tube.
- 10) A meshed (porous) steel pipe/tube used as concrete reinforcement as claimed in claim1, it can be used as load bearing member during construction period.

REFERENCES

A.H.Nilson, "Design of Concrete Structures," 12th edition, ISBN 0-07-046587-8, pp.265.